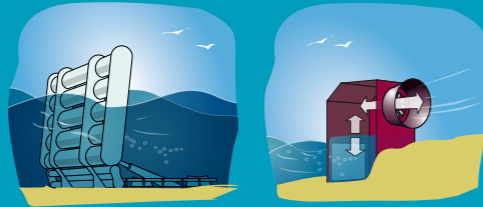


The technologies

The two most promising technologies for early commercial development in Europe are wave and tidal power:

1. Wave power

Devices can be bottom-mounted or floating, and sited at various distances from the shore, but all derive their energy from the movements and power of waves.



2. Tidal energy

Current

Devices are placed in-stream and generate energy from the flow of water. Ideal locations are around peninsulas and through restricted channels, such as between islands and the shore.



Barrage

These systems use the rise and fall of tides in estuaries and bays to produce electricity. The technologies are well developed and work is continuing to develop strategies to minimise environmental impact.



Other technologies

These technologies are seen as potentially interesting for supplying electricity in Europe in the longer term:

Temperature

The difference in temperature between warm surface waters and cool deep waters can be harnessed by Ocean Thermal Energy Conversion (OTEC) technologies. These involve pumping cold water up from lower layers to condense warm waters that then run through a turbine.

Salinity gradient

Salinity gradient systems derive energy via osmosis, the natural flow created between seawater and fresh water being passed through a turbine.

Invest now for future returns

The sector still needs support and funding for further research and development, to test prototypes and to develop full-scale devices that can provide a stable supply of electricity to the grid.

But with public finances in Europe under pressure in the current economic climate, there may be little appetite to lay out for the capital costs required to develop, test and deploy wave power and tidal energy devices.

However, there is a strong case for the EU to step in to support ocean energy. This is a long-term investment and, in time, costs will come down. Without Europe-wide support, there is a significant risk that the benefits will not materialise and the potential competitive advantage will be lost to others.

The new EU financial period starting in 2014, along with a new political focus on the sector, represent an opportunity to ensure that past research gains, and future business opportunities and employment prospects, remain in Europe.

What next?

In 2013, the European Commission will publish a policy paper on ocean energy, setting out concrete ideas and proposals.

Meanwhile, and supported by the EU actions already under way, ocean energy will continue to need the support and engagement of Member States. This can, in particular, help decide the allocation of Structural Funds for the 2014-2020 period.

The interest and involvement of stakeholders, particularly coastal regions, is especially welcome, in order to identify and cost the real opportunities and to secure funding. Working together on ocean energy is vital, to achieve job creation and economic growth, and to meet Europe's climate change targets.

More information

http://ec.europa.eu/dgs/maritimeaffairs_fisheries/index_en.htm

and

European Commission, DG Maritime Affairs and Fisheries
Unit C1: Maritime Policy – Atlantic, outermost regions and Arctic
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Harnessing the power of the sea

The future of ocean energy

Maritime
Affairs and
Fisheries

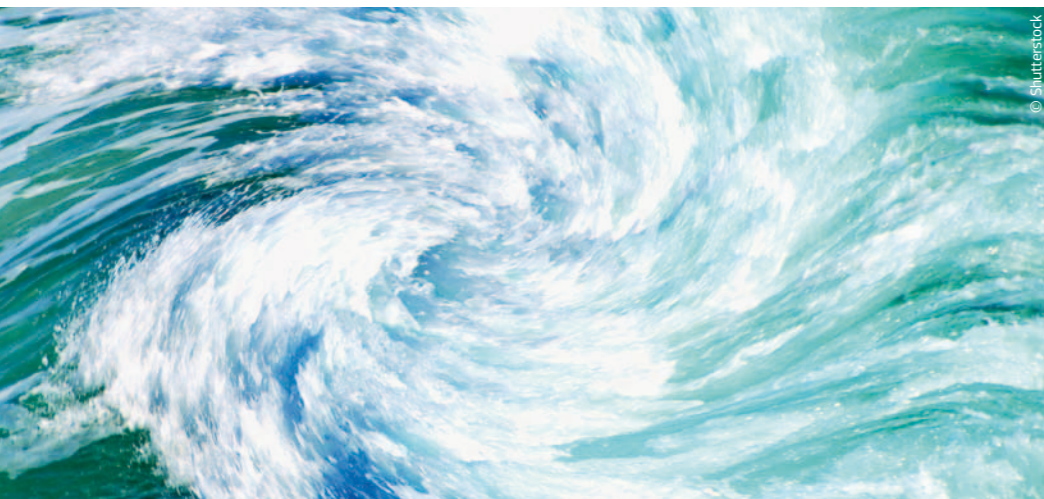
The great untapped potential

Day and night, around the world, the force of the sea can be seen and heard, crashing onto beaches and rocky shores. The endless cycle of waves, tides and currents is driven by wind, the gravitational effects of the moon and ultimately, the power of the sun.

Following decades of research, the ability to tap into this formidable source of energy is finally within our grasp. What it promises is seductive: a limitless and dependable supply of clean energy, accessible on shore and yet largely out of sight, helping to reduce our dependence on fossil fuels and thus our footprint on planet Earth.

Tapping into the power of waves and tides to generate electricity also promises to create a vibrant new energy sector, offering jobs (up to 420 000 by 2050) and economic growth, especially for areas suffering from the decline of traditional maritime industries such as shipbuilding and fisheries.

Estimates suggest wave and tide energy could satisfy 15% of European electricity demand; by 2050, it could help Europe avoid 136 MT/MWh of CO₂ emissions.



The story so far

EU funding programmes have provided over €80 million since 2002 to support research and development into technologies that harness energy from the seas and oceans. Hundreds of projects have tested a variety of technologies, keeping Europe at the cutting edge of global research in the field.

However, despite the considerable investment, very little electricity for domestic and industrial consumers has been generated using ocean power anywhere in the world. Obstacles to deployment include the complexities in moving from testing laboratory models in a safe environment to full scale production in the open sea, fragmentation in the sector, and a lack of grid connections and infrastructure to bring wave energy onshore. This has made for slow progress and kept the unit cost of ocean energy generation relatively high.

The momentum builds

Now, however, there are clear signs that the tide is turning. Some observers suggest that ocean energy could become competitive within a decade. A number of devices have proved their reliability in pilot projects and are starting to be rolled out for large-scale deployment.

Several EU Member States have included marine energy in their Renewable Energy Action Plans. Large power operators are getting involved in the sector. So, too, are major manufacturing companies, industrial groups and finance organisations.

Test sites have also been established outside Europe, notably in Japan, the US and Canada.

The sector is now reaching a critical point. Years of successful testing and demonstration projects have proved that ocean energy has a bright future – but it needs nurturing to become competitive.

In the wind energy sector, an EU framework brought together key actors to drive technological development, by setting common goals and creating a critical mass of activities. This helped the sector grow to maturity. Stakeholders have led calls for a similar strategy to replicate this success in the ocean energy sector.

EU ready to act

The European Commission is now developing a policy framework to support ocean energy. This can help secure Europe's global competitiveness, provide investor confidence, give directions for practical measures and support the scale-up of demonstration projects.

It will also help to deliver a number of objectives agreed by EU Member States in recent years, including on climate change, energy, jobs and growth:

- By broadening Europe's renewable energy sector, it will help to achieve the EU goal of reducing greenhouse gas emissions by 80-95% by 2050, as defined in the **2050 Energy roadmap**.
- It could revitalise coastal communities, which is a central ambition of the EU's Atlantic Strategy, launched in 2011 and designed to help people living and working on the Atlantic coast deal with new economic realities.



- The EU's Blue Growth Strategy identifies ocean energy as a sector with significant growth potential.
- Marine energy is eligible for R&D support, including in Horizon 2020, the EU's EUR 80 billion research and innovation programme for 2014-2020. In part, this will promote research and full-scale testing of innovative renewable technologies.

Ocean energy in practice

Most marine energy technologies are still at the demonstration phase, but several projects are showing excellent results, including the following:

- The European Marine Energy Centre (EMEC) in Orkney, Scotland, which provides testing facilities for technologies such as the **Oyster** wave converter developed by Aquamarine Power.
- In Spain's Basque Country, the **Mutriku** wave power plant consists of 16 turbines of 18.5kW each, with an estimated overall power of 296kW.
- **Wave Star** in Denmark has received funding to upscale and demonstrate a 500kW wave power unit in the North Sea.
- French power company EDF and Irish firm Open-Hydro are developing the **world's largest tidal energy plant** at Paimpol-Bréhat in Brittany.